REMARKS

I. Introduction

In response to the Office Action dated November 1, 2006, no claims have been canceled, amended or added. Claims 1-2, 4-9, 11-17, 35 and 38 remain in the application. Re-examination and re-consideration of the application is requested.

II. Prior Art Rejections

In paragraphs (3)-(4) of the Office Action, claims 1-2, 4-9, 15-1 7, 35 and 38 are rejected under 35 U.S.C. 102(e) as anticipated by Tischler et a1 (US 6,765,240). In paragraphs (5)-(6) of the Office Action, claims 11-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tischler et al. (US 6,765,240) as applied to claims 1-2, 4-9, 15-17,35 and 38 above, and further in view of Redwing et al. (US 5,874,747).

Applicants' attorney respectfully traverses these rejections.

The Office Action asserts that Tischler teaches all the elements of Applicants' claims. However, the fundamental concept in Tischler is the growth of epitaxial layers of gallium nitride (GaN) (in the broad sense, i.e. M*N) at the customary growth temperature (e.g. 1000°C) followed by immediate removal of the substrate (by chemical etching) without cooling down the structure to room temperature. Because the substrate is present only at the growth temperature (or close to it), the structure would not inherently have a net compressive stress.

In Tischler, removing the substrate at high temperature essentially eliminates the problem of thermal expansion mismatch between the epitaxial layers and the substrate, so it is to be expected that the resulting "free-standing" M*N films are free of stress-related defects. However, Tischler does not teach or suggest a solution to the problem of thermal stress management for a "conventional" substrate-film stack, as does Applicants' invention.

Consider, for example, the following statement made on page 3 of the Office Action:

> Also, Tischler et al disclose single crystal has no defects from thermal coefficient of expansion differences, i.e. cracks (col 12, ln 45-65 and col 13, ln 1-5), which is further evidence that there is a net compressive stress because applicant's teach that crack free graded GaN has a net compressive stress, note page 8, lines 1-10 of the specifications.

The first underlined portion of the statement is incorrect. In Tischler, the substrate is removed at high temperature (Tischler generally recommends that the substrate be removed within 300°C of the growth temperature), and therefore there is no substrate present when the cool-down to room temperature begins. As a result, the epitaxial film (which would then be a free-standing layer) is not subject to thermal expansion mismatch, and the resulting stress should be approximately zero.

The second underlined portion of the statement is also incorrect. A GaN layer deposited on a silicon (Si) substrate has a net compressive stress after the structure has cooled down. The Office Action erroneously infers that the resulting free-standing GaN films in Tischler also have a net compressive stress, when in fact they should be stress-free. Tischler simply does not teach or suggest a structure that has a net compressive stress.

Expanding on this argument, the Office Action further asserts, on page 3, that "Tischler et al discloses a semiconductor film comprising all of the claimed structural features of the product." This is incorrect, since Applicants' invention comprises a single crystal graded GaN layer deposited on a Si substrate and having a net compressive stress, where Tischler's end product is a GaN epitaxial layer only, without the substrate and without a net compressive stress. Also, as noted above, before the substrate is removed in Tischler, both the Gan film and the substrate are at a high temperature, and there is no net compressive stress in those conditions.

Redwing fails to overcome the deficiencies of Tischler. Recall that Redwing was cited only against dependent claims 11-14, and only for teaching the use of a buffer layer when a GaN layer is grown on a lattice mismatched substrate. However, the combination of Redwing and Tischler does not teach or suggest a single crystal graded GaN layer deposited on a Si substrate having a varying composition of a substantially continuous grade from an initial composition to a final composition and a net compressive stress.

Thus, Applicants' attorney submits that claims 1-2, 4-9, 15-1 7, 35 and 38 are allowable over Tischler. Further, claims 11-14 are submitted to be allowable over Tischler and Redwing in the same manner, because they are dependent on independent claim 1, and thus contains all the limitations of the independent claims. In addition, dependent claims 11-14 recite additional novel elements not shown by Tischler and Redwing.

III. Conclusion

In view of the above, it is submitted that this application is now in good order for allowance and such allowance is respectfully solicited.

Should the Examiner believe minor matters still remain that can be resolved in a telephone interview, the Examiner is urged to call Applicants' undersigned attorney.

Respectfully submitted,

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